



# PHENIX Detector High Sensitivity Smoke Detection System Test Procedure

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procedure name

**PHENIX Procedure No. PP-2.5.5.6-03**

**Revision: A**

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## **Hand Processed Changes**

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## **Approvals**

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PHENIX S E & I    Date

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Cognizant Scientist/Engineer    Date  
/Activity Manager

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PHENIX Safety    Date

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CA-D ES&H    Date

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Fire Protection Engineer    Date

1. Purpose

This test procedure will verify that the PHENIX VESDA High Sensitivity Smoke Detection System is operational and capable of sensing smoke in the designated detection zones. It is intended to be an inspection, testing, and maintenance document for the two independent VESDA detectors which monitor the regions in and surrounding the Phenix Detector. The two VESDA units are:

- a) The four channel scanner monitoring two zones on the West Carriage and two zones on the East Carriage.
- b) The four channel scanner monitoring the north/south Beam-Beam counters and north/south Muon Trackers.

## 2. Responsibilities

The Phenix Electronic Facilities & Infrastructure (EF & I) Group is responsible to perform this test in cooperation with the BNL Fire Alarm Group. Fire alarm technicians are required to be present for monitoring and re-setting fire panel 189 and 212 Phenix level 3 alarms.

## 3. Prerequisites

- Only system specialists will implement this procedure (P.Giannotti, J.Haggerty, F. Toldo ) and approved by Phenix and or CAD. Certain Safety System Interlock functions are required to be bypassed (disabled) while performing this procedure. Notify the liaison engineer for authorization to bypass trips and for access into the Phenix Bypass Cabinet.
- This procedure can only be performed during shutdown periods of the Phenix detector.
- Perform this procedure as close as possible to the beginning of each Phenix run.
- Notify counting house personnel at the start of the procedure.

## 4. Precautions

The use of a bypass on any system shall be analyzed for safety ramifications and may not be bypassed if the system is put in an unsafe state. Authorization from CA-D may be required for a bypass from the as configured state. Consult the liaison engineer for authorization.

## 5. Procedure

- 5.1 Battery and charger test. A battery and charger unit supply 24 volt power to both VESDA units described in section 1 above. It is located in PCR rack 1.

5.1.1 Visually inspect batteries for corrosion, bulging or leakage. Check and ensure tightness of connections.

Caution: Prior to performing the next step, enable the following trip bypasses located in the Phenix Bypass Cabinet by turning each switch to the “on” position.

- a) West Carriage High Smoke Inboard. (switch #1-1)
- b) West Carriage High Smoke Outboard. (switch #1-2)
- c) East Carriage High Smoke Inboard. (switch #1-3)
- d) East Carriage High Smoke Outboard. (switch #1-4)
- e) Beam-Beam North High Smoke. (switch #5-1)
- f) Beam-Beam South High Smoke. (switch #5-2)
- g) Muon Tracker North High Smoke. (switch #5-3)
- h) Muon Tracker South High Smoke. (switch #5-4)
- i) Phenix HSSD Input To Fire House Alarm – Zone 29. (switch #4-1)

5.1.2 Interrupt AC power to the charger by opening circuit breaker #11 in Lighting Panel “LP” located in the rack room. Measure the battery terminal voltage while it is supplying load to the VESDA units. Replace the batteries if the voltage is less than 23.1 volts DC.

5.1.3 Restore AC power to the charger by re-closing circuit breaker #11 in Lighting Panel “LP”. In the power supply/battery box (PSP), disconnect the batteries from the charger by disconnecting the wires on the “battery” terminals (refer to drawing 1050509-139).

5.1.4 Measure the individual battery voltages. Replace all batteries if any individual battery reads below 12.1 volts DC.

## 5.2 Smoke Sensing Pipe Inspection.

There are two VESDA laser scanner detectors mounted on the external IR shield wall – near the plug door. Each detector has four (4) sensing pipes connected to it. These pipes run into the IR and deliver air samples to the smoke detectors.

There is potential for flammable gas to be drawn into any of the sensing pipes. Therefore fire screens are installed in flanges near the entrance point on the VESDA scanner to quench the possibility of gas combustion.

The pipe runs consist of 1 inch and  $\frac{3}{4}$  inch orange CPVC pipes.

5.2.1 Visually inspect each sensing pipe run. Verify that there are no signs of cracking or abnormalities. Check the flexible tube transitions from the IR floor to the carriages and floor to the Muon Trackers. Ensure the tubes are intact and not pinched or restricted in any way.

Carefully open the flanges on each pipe located near the laser scanner smoke detectors. Inspect the fire screens for dust and clean if necessary. Ensure they are replaced without any open gaps across the flanges.

### 5.3 System Diagnostics Tests.

5.3.1 Using the VESDA system programmer unit in the Phenix Control Room, select “VLS Detector W/E Carriage”. Perform the following diagnostics tests:

- a) Alarm test
- b) Fault test
- c) Flow fault test

Note: The alarm test will simulate a high smoke condition and trigger the Phenix Safety System control room alarms only. Since the trip bypasses remain enabled, no shutdown action will be generated.

5.3.2 Repeat step 5.3.1 except, this time, select “MuTr/Beam-Beam VLS Detector”.

### 5.4 Smoke Test

5.4.1 Introduce smoke into each smoke sensing pipe in the location farthest from the VESDA sensing units. The system transport time is the time from smoke delivery to response detected at the readout displays in the control room. Use the smoke detector tester aerosol manufactured by Home Safeguard Inc. or equivalent. Record each transport time:

Pipe #1 West Carriage Inboard Region Transport Time =

Pipe #2 West Carriage Outboard Region Transport Time =

Pipe #3 East Carriage Inboard Region Transport Time =

Pipe #4 East Carriage Outboard Region Transport Time =

Pipe #5 Beam-Beam North Region Transport Time =

Pipe #6 Beam-Beam South Region

Transport Time =

Pipe #7 Muon Tracker North Region

Transport Time =

Pipe #8 Muon Tracker South Region

Transport Time =

All times are to be entered in seconds. Maximum times are: Pipe #1 = 120 sec. Pipe #2 = 90 sec. Pipe #3 = 60 sec. Pipe # 4 = 40 sec. Pipes # 5, #6, #7, #8 = 90 sec.

## 5.5 Alarm Notification Device Test

This section will test the building alarm bells and strobe lights. It will also verify receipt of the building 1008 alarm (zone 29) at the fire house alarm panel.

### 5.5.1 Clear any alarms indicating on the VESDA Control/Display unit. Return the following system trip bypass to normal:

a) Phenix HSSD Input To Fire House Alarm – Zone 29 (switch #4-1).

### 5.5.2 Introduce smoke into sensing pipe #1 monitoring the West Carriage inboard Region. Verify that the alarm bells and strobes are activated in the following 1008 areas:

- a) 1008A Phenix Control Room
- b) 1008A Counting House Rack Room
- c) 1008A Utility Room Corridor
- d) 1008A External Wall Of Building
- e) 1008A Assembly Hall
- f) 1008A Intersection Region (IR)
- g) 1008E Office trailers
- h) 1008F Gas Mixing House

Also, verify that the Zone 29 alarm is received at the BNL Fire House. Reset all alarms.

### 5.5.3 Introduce smoke into sensing pipe #2 monitoring the West Carriage outboard region. Verify the same responses as in step 5.5.2.

### 5.5.4 Introduce smoke into sensing pipe #3 monitoring the East Carriage inboard region. Verify the same responses as in step 5.5.2.

- 5.5.5 Introduce smoke into sensing pipe #4 monitoring the East Carriage outboard region. Verify the same responses as in step 5.5.2.
  - 5.5.6 Introduce smoke into sensing pipe #5 monitoring the Beam-Beam North region. Verify the same responses as in step 5.5.2.
  - 5.5.7 Introduce smoke into sensing pipe #6 monitoring the Beam-Beam South region. Verify the same responses as in step 5.5.2.
  - 5.5.8 Introduce smoke into sensing pipe #7 monitoring the Muon Tracker North region. Verify the same responses as in step 5.5.2.
  - 5.5.9 Introduce smoke into sensing pipe #8 monitoring the Muon Tracker South region. Verify the same responses as in step 5.5.2.
  - 5.5.7 Alarm loop continuity supervisory circuit test. Temporarily lift the black wire on TB-1 terminal 59 inside the BNL fire interface cabinet. This is the alarm wire point boundary between the Phenix Safety System and the BNL fire protection panel. Verify that a Zone 29 Trouble alarm is received at the BNL Fire House.
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- 5.6 Return Phenix Fire Alarm System to normal operation.
  - 5.6.1 Return all system bypass switches to the off position. Verify that Phenix control room alarm “Phenix bypass active” number A 6-8 is clear.
  - 5.6.2 Notify Phenix personnel that the test is complete.

